The Cost Of A Telephone Call Is $0.75 + $0.25 Times The Number Of Minutes. Write An Algebraic Expression

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Understanding how to translate real-world problems into algebraic expressions is a fundamental skill in mathematics. One common scenario involves calculating the cost of a telephone call based on its duration. In this article, we will explore how to model the cost of a telephone call using an algebraic expression, specifically focusing on the formula:

The cost of a telephone call = $0.75 + $0.25 times the number of minutes.

By breaking down this problem, we’ll learn how to develop an algebraic expression that accurately represents the total cost, analyze its components, and understand its application in real-world contexts. This guide is designed to help students, teachers, and anyone interested in applying algebra to everyday situations.

Understanding the Cost Components of a Telephone Call

Before creating an algebraic expression, it’s essential to understand the different parts that contribute to the total cost of a phone call.

Fixed Cost

- Definition: A fixed cost is a charge that remains constant regardless of the duration of the call.
- Example: In our scenario, the fixed cost is $0.75, which could represent a connection fee or a basic service charge.

Variable Cost

- Definition: A variable cost depends on the number of minutes of the call.
- Example: Here, it is $0.25 per minute, meaning the longer the call, the higher the total charge.

Total Cost Calculation

- The total cost combines both fixed and variable costs.
- The total cost increases as the number of minutes increases, reflecting the variable component.

Developing the Algebraic Expression

To formulate the algebraic expression, consider the following:

- Let x represent the number of minutes of the phone call.
- The fixed cost is $0.75.
- The variable cost per minute is $0.25.

The total cost, denoted as C(x), can be expressed as:

$$ C(x) = \text{fixed cost} + (\text{cost per minute} \times \text{number of minutes}) $$

Substituting the known values:

$$ C(x) = 0.75 + 0.25x $$

This linear algebraic expression allows us to compute the total cost for any number of minutes.

Interpreting the Algebraic Expression C(x) = 0.75 + 0.25x

Understanding this expression is key to applying it effectively.

Components of the Expression

- 0.75: The fixed cost, charged regardless of call length.
- 0.25x: The variable component, which scales with call duration.

Practical Applications

- Estimating costs for different call lengths.
- Comparing costs of various call durations.

- Planning budgets for phone expenses.

Example Calculations

1. Call lasting 10 minutes:

$$ C(10) = 0.75 + 0.25 \times 10 = 0.75 + 2.50 = \$3.25 $$

2. Call lasting 20 minutes:

$$ C(20) = 0.75 + 0.25 \times 20 = 0.75 + 5.00 = \$5.75 $$

3. Call lasting 0 minutes (just the connection fee):

$$ C(0) = 0.75 + 0.25 \times 0 = 0.75 + 0 = \$0.75 $$

These calculations demonstrate how the total cost varies with call duration.

Graphing the Cost Function

Visualizing the function $C(x) = 0.75 + 0.25x$ helps in understanding its behavior.

Plotting the Graph

- The x-axis represents the number of minutes.
- The y-axis represents the total cost in dollars.
- The graph is a straight line with a slope of 0.25 and a y-intercept at 0.75.

Insights from the Graph

- The y-intercept (0.75) confirms the fixed cost.
- The slope (0.25) indicates the rate at which the cost increases per minute.
- The line extends infinitely, suggesting cost increases indefinitely as call lengthens.

Applications and Benefits of Algebraic Modeling

in Real Life

Modeling costs with algebraic expressions is a powerful approach with many practical uses.

Key Benefits

- Enables quick estimation of expenses.
- Facilitates budgeting and financial planning.
- Supports decision-making, such as whether to make longer calls or use alternative communication methods.
- Enhances understanding of how different variables affect overall costs.

Other Real-World Examples

- Calculating taxi fares based on distance traveled.
- Estimating electricity bills based on usage.
- Computing shipping costs based on weight and distance.

Practice Problems for Mastery

To reinforce understanding, here are some practice problems:

1. Calculate the total cost of a 15-minute phone call.
2. Determine the call duration if the total cost is $8.00.
3. Create an algebraic expression for a similar scenario where the fixed cost is $1.00, and the cost per minute is $0.20.
4. Plot the graph of the original cost function and interpret its features.

Conclusion: Mastering Algebraic Expressions for Cost Calculations

Transforming a real-world problem like calculating the cost of a telephone call into an algebraic expression is an essential skill in mathematics. The formula $C(x) = 0.75 + 0.25x$ succinctly captures how fixed and variable costs combine to determine total expenses based on call duration. Understanding and applying this model allows individuals to make informed decisions, plan budgets effectively, and develop a deeper appreciation for the power of algebra in everyday life. Whether for academic purposes or practical financial planning, mastering algebraic expressions like this one equips you with the tools to analyze and interpret various cost scenarios confidently.

Keywords for SEO Optimization:
- Algebraic expression for telephone call cost
- Cost of phone call formula
- Calculate phone call charges
- Fixed and variable costs in algebra
- Cost modeling in real life
- Algebra practice problems
- Graphing cost functions
- Budgeting for phone expenses

Frequently Asked Questions

What is the algebraic expression for the cost of a telephone call if the cost is $0.75 plus $0.25 times the number of minutes?

The algebraic expression is $C = 0.75 + 0.25m$, where C is the total cost and m is the number of minutes.

If a call lasts 10 minutes, how much does it cost using the expression C = 0.75 + 0.25m?

The cost is $C = 0.75 + 0.25(10) = 0.75 + 2.50 = \$3.25$.

What does the coefficient 0.25 represent in the expression C = 0.75 + 0.25m?

It represents the cost per minute of the call.

How would you write an expression for the cost if the call lasts n minutes instead of m?

The expression would be $C = 0.75 + 0.25n$.

If the total cost of a call is $4.75, how many minutes was the call?

Set up the equation: $4.75 = 0.75 + 0.25m$. Subtract 0.75 from both sides: $4.00 = 0.25m$. Divide both sides by 0.25: $m = 16$ minutes.

What is the initial fixed cost in the telephone call cost formula?

The initial fixed cost is $0.75, which is the base charge regardless of call length.

How can you use the algebraic expression to find the cost of a 20-minute call?

Substitute m = 20 into the expression: C = 0.75 + 0.25(20) = 0.75 + 5 = $5.75.

Why is it important to write the cost of a call as an algebraic expression?

It allows you to easily calculate the cost for any number of minutes and understand the relationship between call length and cost.

Additional Resources

Understanding the Cost of a Telephone Call: Crafting an Algebraic Expression

When analyzing everyday problems mathematically, one of the most fundamental skills is translating real-world situations into algebraic expressions. A common scenario involves calculating the total cost of a telephone call based on a fixed charge plus a variable charge depending on the duration of the call. In this comprehensive review, we will explore this problem in detail, breaking down the components, developing the algebraic expression, and discussing its applications and implications.

Introduction to the Problem Statement

Imagine you are paying for a telephone call where the total cost depends on two factors:

- A flat fee that is charged regardless of call length.
- A variable fee that depends on the number of minutes of the call.

Specifically, the problem states:

> The cost of a telephone call is $0.75 plus $0.25 times the number of minutes.

This problem is a classic example used in algebra courses to teach how to model real-world scenarios with expressions, equations, and functions.

Breaking Down the Components of the Cost

To understand the problem fully, let's analyze its components carefully:

Fixed Cost (Base Fee)

- Amount: $0.75
- Description: This is a one-time fee charged for initiating the call, regardless of its length.
- Implication: No matter how short or long the call, this fee remains constant.

Variable Cost (Per Minute Fee)

- Amount: $0.25 per minute
- Description: This fee depends directly on the duration of the call.
- Implication: The longer the call, the higher the total variable cost.

Total Cost

- Expression: The total cost combines both fixed and variable costs.
- Purpose: To create an algebraic expression that accurately models this total.

Developing the Algebraic Expression

The core goal is to formulate an algebraic expression that calculates the total cost based on the number of minutes, which we'll denote as m.

Step 1: Define the Variable

Let:

$$
m = \text{Number of minutes of the call}
$$

Step 2: Express the Fixed Cost

The fixed cost is a constant:

$$
\text{Fixed Cost} = 0.75
$$

Step 3: Express the Variable Cost

Since the variable cost depends on m:

$$
\text{Variable Cost} = 0.25 \times m
$$

Step 4: Combine the Components

Adding fixed and variable costs:

$$
\text{Total Cost} = \text{Fixed Cost} + \text{Variable Cost}
$$

which translates to:

$$
\boxed{C(m) = 0.75 + 0.25m}
$$

This is the algebraic expression representing the total cost C as a function of the number of minutes m.

Interpreting the Algebraic Expression

Understanding the expression $C(m) = 0.75 + 0.25m$ involves analyzing its components:

- Constant Term (0.75): Represents the initial fee incurred regardless of call length.
- Coefficient of m (0.25): Indicates the cost per minute.
- Variable m: The number of minutes, which can vary based on the call.

This expression models a linear relationship:

- Linear Function: Because the total cost increases linearly with the number of minutes.
- Slope: 0.25, representing the rate of increase per additional minute.
- Y-intercept: 0.75, the total cost when $m = 0$, which aligns with the

fixed fee.

Practical Applications and Usage

Having an algebraic expression for the cost enables various practical applications:

1. Calculating Cost for Specific Call Durations

Suppose you want to find the total cost for a 10-minute call:

$$
C(10) = 0.75 + 0.25 \times 10 = 0.75 + 2.50 = \$3.25
$$

Similarly, for a 20-minute call:

$$
C(20) = 0.75 + 0.25 \times 20 = 0.75 + 5.00 = \$5.75
$$

2. Budget Planning

If a person has a budget of $10 for calls, they can determine the maximum call length:

$$
C(m) \leq 10
$$
$$
0.75 + 0.25m \leq 10
$$
$$
0.25m \leq 10 - 0.75 = 9.25
$$
$$
m \leq \frac{9.25}{0.25} = 37
$$

This means the maximum call duration within a $10 budget is 37 minutes.

3. Graphical Representation

Plotting $C(m)$ against m:

- The graph is a straight line.
- Y-intercept at 0.75.

- Slope of 0.25.
- Interpretation: Each additional minute adds $0.25 to the total cost.

This visualization can help in understanding how costs accumulate as call duration increases.

Extensions and Variations of the Model

The basic model can be expanded or modified to fit different scenarios:

a) Different Fixed or Per-Minute Fees

Suppose the fixed fee changes or the per-minute rate varies:

- Fixed fee: \$1.00
- Per-minute rate: \$0.20

The expression becomes:

$$
C(m) = 1.00 + 0.20m
$$

b) Introducing Minimum or Maximum Charges

If the phone company charges at least \$2 regardless of call length, the model adjusts:

$$
C(m) = \max(0.75 + 0.25m, 2)
$$

c) Nonlinear Costs

In some cases, costs may not increase linearly—for example, discounts for longer calls or additional charges after a certain duration, leading to more complex models.

Mathematical Significance and Education

Formulating such expressions is central to understanding how algebra models real-world problems. It helps in:

- Developing problem-solving skills.
- Recognizing linear relationships.
- Applying algebra to economics, finance, and everyday decision-making.

This specific problem exemplifies how algebra can be used to plan budgets, compare options, and understand cost structures.

Real-World Implications and Considerations

While the model provides a clear mathematical framework, real-world scenarios might involve additional factors:

- Taxes and fees: Additional charges might be added, complicating the expression.
- Different billing cycles: Some plans bill in blocks, requiring the use of ceiling functions or piecewise functions.
- Discounts or promotions: These can alter the fixed fee or per-minute rate dynamically.

Understanding the core algebraic expression allows consumers and businesses to adapt models to these variations.

Summary and Final Thoughts

In conclusion, the problem of calculating the total cost of a telephone call based on a fixed fee plus a per-minute charge is a classic example of translating a real-world scenario into an algebraic expression. The key findings include:

- The cost function is linear: $C(m) = 0.75 + 0.25m$.
- The fixed fee and per-minute rate are represented as constants and coefficients.
- This model allows for easy calculation, budgeting, and visualization.
- It serves as a foundational example for understanding linear functions and their applications.

Mastering such modeling techniques enhances problem-solving skills and provides insight into how algebra is used in everyday life and various industries. Developing fluency in creating and interpreting these expressions is essential for students, professionals, and anyone interested in applying mathematics practically.

In essence, translating the given scenario into the algebraic expression \(C(m) = 0.75 + 0.25m \) encapsulates the core relationship between call duration and cost, providing a powerful tool for analysis, planning, and decision-making.

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